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## Technical Data Sheet

### Hysol® Product M-31CL

formerly Durabond M-31CL

Medical Products, August 2001

#### PRODUCT DESCRIPTION

LOCTITE® Hysol® Product M-31CL is a low-viscosity, epoxy adhesive. Once mixed, the two-part epoxy cures at room temperature with minimal shrinkage and forms an ultra clear adhesive bondline with excellent impact resistance. When fully cured, the epoxy withstands exposure to a wide range of chemicals and solvents, and has excellent dimensional stability over a wide temperature range.

#### TYPICAL APPLICATIONS

Designed for bonding, small potting, staking and laminating applications where optical clarity and excellent structural, mechanical, and electrical insulating properties are required. Bonds most materials including glass, optical fibers, ceramics, metals, and many rigid plastics. Loctite Product M-31CL complies with the Loctite ISO-10993 Biocompatibility test program. Certificates of Compliance are available through the Loctite Quality Department. Suitable for use in assembly of disposable medical devices.

#### PROPERTIES OF UNCURED MATERIAL

Resin	Value	Typical	Range
Chemical Type	Epoxy		
Appearance	Clear/yellow liquid		
Specific Gravity @ 25°C	1.10		1.0 to 1.2
Viscosity @ 25°C, mPa.s (cP)	10,500		9,000 to 12,000
Flash Point (TCC), °C (°F)	>93 (>200)		

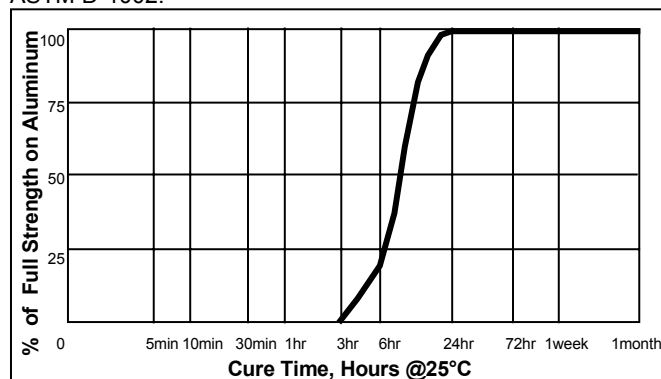
Hardener	Value	Typical	Range
Chemical Type	Amine		
Appearance	Light colored liquid		
Specific Gravity @ 25°C	1.00		0.9 to 1.1
Viscosity @ 25°C, mPa.s (cP)	2,250		1,500 to 3,000
Flash Point (TCC), °C (°F)	>93 (>200)		

Mixture	Typical Value
Appearance	Ultra Clear
Specific Gravity @ 25°C	1.07
Mix Ratio (R:H) by Weight	100 to 46
by Volume	2 to 1

#### TYPICAL CURING PERFORMANCE

##### Cure speed

The graph below shows the shear strength developed over time on abraded, acid etched aluminum lap shears with an average bondline gap of 3 to 9 mils and tested according to ASTM D-1002.



#### Curing Properties

(@ 25°C unless noted)	Typical Value
Working Life, minutes	30
Tack Free time (low humidity), minutes	160

#### TYPICAL PROPERTIES OF CURED MATERIAL

(@ 25°C unless noted)

Physical Properties	Typical Value
Dielectric Strength, Volts/Mil	500
Tensile Strength ASTM D638, psi	8,000
Tensile Elongation ASTM D-638, %	8
Hardness ASTM D-1706, Shore D	85
Glass Transition Temperature, Tg, °C	70

#### PERFORMANCE OF CURED MATERIAL

##### Shear Strength vs Substrate

(Substrates cured for 5 days @ 22°C)

Substrate	Typical Value
	N/mm <sup>2</sup> (psi)
Lap Shear (ASTM D 1002)	
Grit-Blasted Steel	21.4 3100
Aluminum (Abraded/Acid Etched, 3 to 9 mil gap)	29.4 4270
Aluminum (Anodized)	21.2 3070
Stainless Steel	13.6 1970
Polycarbonate	13.4 1950
Nylon	2.4 350
Wood (Fir)	12.1 1750

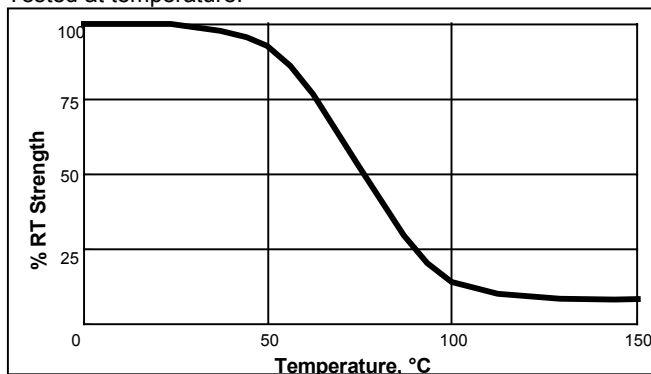
Block Shear (ASTM D 4501)	N/mm <sup>2</sup> (psi)
PVC	7.0 1010
ABS	8.4 1220
Epoxy	20.6 2980
Acrylic	1.2 180
Glass	24.4 3540

#### TYPICAL ENVIRONMENTAL RESISTANCE

##### Hot Strength

Test procedure :	ASTM D-1002
Substrate:	Abraded, acid etched aluminum
Bondline gap, mils:	3 to 9
Cure procedure:	12 hours at 65°C & 4 hours at 22°C

Tested at temperature.



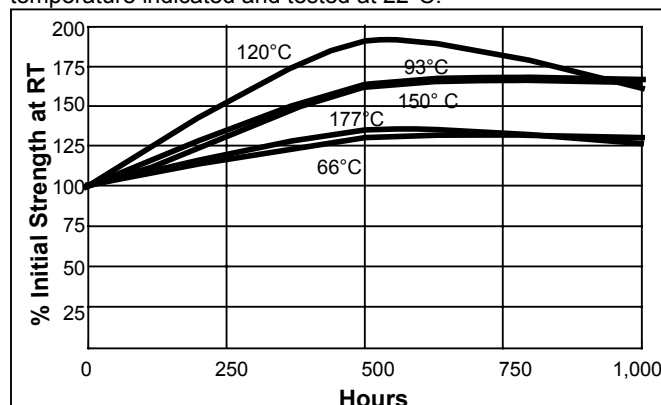
NOT FOR PRODUCT SPECIFICATIONS.

THE TECHNICAL DATA CONTAINED HEREIN ARE INTENDED AS REFERENCE ONLY.

PLEASE CONTACT LOCTITE CORPORATION QUALITY DEPARTMENT FOR ASSISTANCE AND RECOMMENDATIONS ON SPECIFICATIONS FOR THIS PRODUCT.  
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### Heat Aging

Cured for 5 days at 22°C on steel with no induced gap, aged at temperature indicated and tested at 22°C.



### Chemical / Solvent Resistance

Cured for 5 days at 22°C on steel with no induced gap, aged under conditions indicated and tested at 22°C.

Solvent	Temp.	% Initial Strength retained at	
		500 hr	1000 hr
Air	87°C	159	152
Motor Oil (10W-30)	87°C	160	146
Unleaded Gasoline	87°C	123	111
Water/Glycol (50%/50%)	87°C	147	142
Salt/Fog ASTM B-117	22°C	73	89
95% Relative Humidity	38°C	107	118
Condensing Humidity	49°C	93	94
Water	22°C	104	90
Acetone	22°C	104	109
Isopropyl Alcohol	22°C	124	124

### GENERAL INFORMATION

**This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.**

**For safe handling information on this product, consult the Material Safety Data Sheet, (MSDS).**

### APPROVALS

Hysol M-31CL has been tested to ISO-10993. It is particularly suited for use in disposable medical device assemblies.

### Effects of Sterilization

In general, products similar in composition to Loctite Product M-31CL subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kilorays cumulative) show excellent bond strength retention. Product M-31CL maintains bond strength after 1 cycle of steam autoclave. It is recommended that customers test specific parts after subjecting them to the preferred sterilization method. Consult with Loctite for a product recommendation if your device will see more than 3 sterilization cycles.

### Directions for use

- For high strength structural bonds, removal of surface contaminants such as paint, oxide films, oils, dust, mold release agents and all other surface contaminants.
- Use gloves to minimize skin contact. DO NOT use solvents for cleaning hands.

- Dual Cartridges:** To use simply insert the cartridge into the application gun and start the plunger into the cylinders using light pressure on the trigger. Next, remove the cartridge cap and expel a small amount of adhesive to be sure both sides are flowing evenly and freely. If automatic mixing of resin and hardener is desired, attach the mixing nozzle to the end of the cartridge and begin dispensing the adhesive. For hand mixing, expel the desired amount of the adhesive and mix thoroughly. Mix approximately 15 seconds after uniform color is obtained.
- For maximum bond strength apply adhesive evenly to both surfaces to be joined.
- Application to the substrates should be made within 30 minutes. Larger quantities and/or higher temperatures will reduce this working time.
- Join the adhesive coated surfaces and allow to cure at 25°C (77°F) for 24 hours for high strength. Heat up to 93°C (200°F), will speed curing.
- Keep parts from moving during cure. Contact pressure is necessary. Maximum shear strength is obtained with a 3-9 mil bond line.
- Excess uncured adhesive can be cleaned up with ketone type solvents.

### Storage

Product shall be ideally stored in a cool, dry location in unopened containers at a temperature between 8°C to 28°C (46°F to 82°F) unless otherwise labeled. Optimal storage is at the lower half of this temperature range. To prevent contamination of unused product, do not return any material to its original container. For further specific shelf life information, contact your local Technical Service Center.

### Data Ranges

The data contained herein may be reported as a typical value and/or range. Values are based on actual test data and are verified on a periodic basis.

### Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.